34. (ONCE AMENDED) An optical amplifier receiving optical signals of a first wavelength band of a C band and a second separate wavelength band of a L band, wherein each wavelength band contains a plurality of optical signals of different wavelengths, said amplifier comprising:

a band demultiplexer providing a first band output and a second band output;

an amplifying unit amplifying the second band output;

a band multiplexer combining the first band output and the amplified second band output; and

a C/L ratio control section, controlling a balance between a first wavelength band optical signal power and a second wavelength band optical signal power.

C3 Cncld

35. (ONCE AMENDED) An optical amplifying system receiving optical signals of a first wavelength band of a C band and a second separate wavelength band of a L band, wherein each wavelength band contains a plurality of optical signals of different wavelengths, said system comprising:

an optical amplifier selectively amplifying the optical signals of the second wavelength band; and

a C/L ratio control section, controlling a balance between a first wavelength band optical signal power and a second wavelength band optical signal power.

REMARKS

INTRODUCTION:

In accordance with the foregoing, claims 1, 18, and 31-35 have been amended. No new matter is being presented, and approval and entry are respectfully requested.

Claims 1-12, 14, and 18-35 are pending and under consideration. Reconsideration is requested.

REJECTION UNDER 35 U.S.C. §102:

In the Office Action at page 2, the Examiner rejected claims 1 and 18-32 under 35 U.S.C. §102 as being anticipated by Kidorf et al. This rejection is respectfully traversed and reconsideration is requested.

Independent claims 1, 18 and 31-32 have been amended correspondingly to show that, as recited in amended claim 1, the present claimed invention emphasizes an optical amplifier that amplifies wavelength division multiplexed signal light having respective optical signals of "**a first wavelength band of a C band** (emphasis added)" having a plurality of different wavelength optical

signals and "**a second wavelength band of a L band** (emphasis added)" having a plurality of optical signals different from the first wavelength band, wherein the optical signals of the second wavelength band have been **selectively** Raman amplified. That is, the present claimed invention emphasizes **balance control** of a first wavelength band (C band) and a second wavelength band (L band) (see Figs. 1 & 2) wherein the first wavelength band is amplified to a predetermined level and is multiplexed with a selectively Raman amplified second wavelength band. In contrast, Kidorf et al. teaches applying a Raman amplifier and a remotely pumped erbium-doped fiber amplifier to tune an entire signal, i.e., a signal not split into a C band and an L band for balance control (see lines 18-39, col. 3). Since Kidorf et al. teaches amplification of an entire signal, it is respectfully submitted that **Kidorf et al. teaches away** from the present invention, which teaches amplification of the C band and the L band of the signal according to different schemes to provide balance control of the optical power of the two bands. Since dependent claims 19-30 depend from amended claim 18 and incorporate the limitations of claim 18, claims 19-30 are deemed to be allowable for the same reasons that amended claim 18 is allowable.

Thus, it is respectfully submitted that claims 1 and 18-32 are not anticipated by Kidorf et al. and are allowable under 35 U.S.C. § 102(b).

In the Office Action at page 3, the Examiner rejected claims 33-35 as being anticipated by Ma et al. Claims 33-35 have been amended to include a C/L ratio control section, controlling a balance between a first wavelength band optical signal power and a second wavelength band optical signal power. Ma et al. teaches employing a Raman amplifier as a preamplifier, then splitting the optical signal into a plurality of bands that individually undergo amplification by dedicated optical amplifiers (see ll. 32-37, col. 2). However, Ma et al. fails to teach or suggest a C/L ratio control section, controlling a balance between the first wavelength band optical signal power and the second wavelength band optical signal power, as is taught by the present invention (see amended claims 33-35).

Thus, it is respectfully submitted that claims 33-35 are not anticipated by Ma et al. and are allowable under 35 U.S.C. § 102(b).

REJECTION UNDER 35 U.S.C. §103:

On page 4 of the Office Action, the Examiner rejected claim 2 under 35 U.S.C. § 103(a) as being unpatentable over Kidorf et al. in view of Ma et al.

On page 5 of the Office Action, the Examiner rejected claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Kidorf et al. in view of Ma et al. as applied to claim 2, and further in view of

Sun et al.

On page 6 of the Office Action, the Examiner rejected claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Kidorf et al. in view of Mitsuda et al.

On page 6 of the Office Action, the Examiner rejected claim 6 under 35 U.S.C. § 103(a) as being unpatentable over Kidorf et al. in view of Mitsuda et al. as applied to claim 5, and further in view of Sun et al.

On page 7 of the Office Action, the Examiner rejected claim 8 under 35 U.S.C. § 103(a) as being unpatentable over Kidorf et al.

On page 7 of the Office Action, the Examiner rejected claim 9 under 35 U.S.C. § 103(a) as being unpatentable over Kidorf et al. in view of Antos et al.

On page 8 of the Office Action, the Examiner rejected claim 10, 11, and 12 under 35 U.S.C. § 103(a) as being unpatentable over Kidorf et al. as applied to claim 1, and further in view of Kosaka et al.

On page 8 of the Office Action, the Examiner rejected claim 14 under 35 U.S.C. § 103(a) as being unpatentable over Kidorf et al. in view of Mitsuda et al. as applied to claim 5 above, and further in view of Kosaka

The above-cited dependent claims depend from the above-discussed independent claim 1 and are patentable over the prior art for the reasons discussed above. The dependent claims also recite additional features not taught or suggested by the prior art. For example, claim 8 recites utilizing a Raman amplification producing medium that is an optical fiber which is designed so that a non-linear effective cross section is small compared to a 1.3 μm zero dispersion single mode fiber. It is respectfully submitted that the dependent claims 2-3, 5-6, 8-12, and 14 are independently patentable over the prior art.

ATTACHMENT

Attached hereto is a "Version With Markings to Show Changes Made," comprising a marked-up version of changes made to the Specification and Claims by the current amendment.

CONCLUSION:

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot. And further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited. At a

minimum, this Amendment should be entered at least for purposes of Appeal as it either clarifies and/or narrows the issues for consideration by the Board.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited and possibly concluded by the Examiner contacting the undersigned attorney for a telephone interview to discuss any such remaining issues.

If there are any additional fees associated with the filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: 12/20/2

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VERSION WITH MARKING TO SHOW CHANGES MADE

IN THE CLAIMS

Please **AMEND** claims 1, 18 and 31-35 as follows. The remaining claims are reprinted, as a convenience to the Examiner, as they presently stand before the U.S. Patent and Trademark Office.

1. (THREE TIMES AMENDED) An optical amplifier for amplifying wavelength division multiplexed signal light which has respective optical signals of a first wavelength band of a C band containing a plurality of optical signals with several wavelengths different from each other and a second wavelength band of a L band containing a plurality of optical signals with several wavelengths different from the wavelengths of the optical signals contained in the first wavelength band, comprising:

optical amplifying means amplifying said wavelength division multiplexed signal light using a rare earth element doped fiber to which excitation light is supplied,

wherein the excitation light used by said optical amplifying means has a wavelength capable of producing Raman amplification with respect to optical signals of said second wavelength band, [and]

said optical amplifying means supplying said excitation light which has the wavelength capable of producing the Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been selectively Raman amplified by said Raman amplification producing medium, [are] is input to said optical amplifying means.

2. (AS ONCE AMENDED) An optical amplifier according to claim 1,

wherein there is provided demultiplexing means demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and multiplexing means multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing means,

said optical amplifying means has a first amplifying section amplifying optical signals of the first wavelength band which have been demultiplexed by said demultiplexing means, and a second

amplifying section amplifying optical signals of the second wavelength band which have been demultiplexed by said demultiplexing means, and

said optical amplifying means supplying via said demultiplexing means a part of said excitation light used in said first amplifying section to said Raman amplification producing medium, so that optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input via said demultiplexing means to said second optical amplifying section.

3. (AS UNAMENDED) An optical amplifier according to claim 2, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said first optical amplifying section contains a 1480nm band.

4. (AS ONCE AMENDED) An optical amplifier according to claim 3, wherein said first optical amplifying section comprises an erbium doped fiber, at least one excitation light source generating excitation light of a 1480nm band, and an optical coupler supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and said demultiplexing means and supplied to said Raman amplification producing medium.

5. (AS ONCE AMENDED) An optical amplifier according to claim 1, wherein there is provided demultiplexing means demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and multiplexing means multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing means,

said optical amplifying means has a pre-stage amplifying section collectively amplifying said wavelength division multiplexed signal light input to said demultiplexing means, and a second optical amplifying section amplifying only optical signals of the second wavelength band which have been demultiplexed by said demultiplexing means, and

said optical amplifying means supplying a part of said excitation light used in a part of said pre-stage optical amplifying section to said Raman amplification producing medium, wavelength division multiplexed signal light which contains optical signals of said second wavelength band which have been Raman amplified by said Raman amplification producing medium are input to said pre-stage optical amplifying section.

6. (AS UNAMENDED) An optical amplifier according to claim 5, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said pre-stage optical amplifying section contains a 1480nm band.

7. (AS ONCE AMENDED) An optical amplifier according to claim 6, wherein said pre-stage optical amplifying section comprises an erbium doped fiber, at least one excitation light source generating excitation light of a 1480nm band, and an optical coupler supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and supplied to said Raman amplification producing medium.

8. (AS UNAMENDED) An optical amplifier according to claim 1, wherein said Raman amplification producing medium is an optical fiber which is designed so that a non-linear effective cross section is small compared to a 1.3μm zero dispersion single mode fiber.

9. (AS ONCE AMENDED) An optical amplifier according to claim 1, wherein said external transmission path is of a hybrid transmission path formed by connecting a positive dispersion fiber having a positive wavelength dispersion value and a positive dispersion slope with respect to a signal light wavelength band, and a negative dispersion fiber having a negative wavelength dispersion value and a negative dispersion slope with respect to the signal light wavelength band, wherein one end on the side of said negative dispersion fiber is arranged at an input side of said optical amplifying means and functions as said Raman amplification producing medium.

10. (AS ONCE AMENDED) An optical amplifier according to claim 1, wherein there is provided optical power constant control means monitoring an output power of said wavelength division multiplexed signal light, and controlling an excitation light driving condition of said optical amplifying means so that said output power becomes constant.

11. (AS ONCE AMENDED) An optical amplifier according to claim 1, wherein there is provided gain constant control means monitoring a gain in said optical amplifying means, and controlling an excitation light driving condition of said optical amplifying means so that said gain becomes constant.

12. (AS ONCE AMENDED) An optical amplifier according to claim 1, wherein there is provided supervisory control means processing a supervisory control signal transmitted together with said wavelength division multiplexed signal light.

14. (AS ONCE AMENDED) An optical amplifier according to claim 5 comprising:

first power monitor means monitoring the optical signal power of the first wavelength band which has been demultiplexed by said demultiplexing means;

second power monitor means monitoring the optical signal power of the second wavelength band which has been amplified by said second optical amplifying section; and

optical power deviation control means controlling the operation of at least one of said pre-stage optical amplifying section and said second optical amplifying section in response to the respective monitor results of the first and second power monitor means, so that the optical power deviation for the first and the second wavelength bands becomes constant.

18. (TWICE AMENDED) An optical amplifier for amplifying wavelength division multiplexed signal light which has respective optical signals of a first wavelength band <u>of a C band</u> containing a plurality of optical signals with several wavelengths different from each other and a second wavelength band <u>of a L band</u> containing a plurality of optical signals with several wavelengths different from the wavelengths of the optical signals contained in the first wavelength band, comprising:

an optical amplifying unit amplifying said wavelength division multiplexed signal light using a rare earth element doped fiber to which excitation light is supplied,

wherein the excitation light used by said optical amplifying unit has a wavelength capable of producing Raman amplification with respect to optical signals of said second wavelength band, and

said optical amplifying unit supplying said excitation light which has the wavelength capable of producing the Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying unit, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been <u>selectively</u> Raman amplified by said Raman amplification producing medium, [are] <u>is</u> input to said optical amplifying unit.

19. (AS UNAMENDED) An optical amplifier according to claim 18,

wherein there is provided a demultiplexing unit demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and a multiplexing unit multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing unit,

said optical amplifying unit has a first amplifying section amplifying optical signals of the first wavelength band which have been demultiplexed by said demultiplexing unit, and a second amplifying section amplifying optical signals of the second wavelength band which have been demultiplexed by said demultiplexing unit, and

said optical amplifying unit supplying via said demultiplexing unit a part of said excitation light used in said first amplifying section to said Raman amplification producing medium, so that optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input via said demultiplexing unit to said second optical amplifying section.

20. (AS UNAMENDED) An optical amplifier according to claim 19, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said first optical amplifying section contains a 1480nm band.

21. (AS UNAMENDED) An optical amplifier according to claim 20, wherein said first optical amplifying section comprises an erbium doped fiber, at least one excitation light source generating excitation light of a 1480nm band, and an optical coupler supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and said demultiplexing unit and supplied to said Raman amplification producing medium.

22. (AS UNAMENDED) An optical amplifier according to claim 18, wherein there is provided a demultiplexing unit demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and a multiplexing unit multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing unit,

said optical amplifying unit has a pre-stage amplifying section collectively amplifying said wavelength division multiplexed signal light input to said demultiplexing unit, and a second optical amplifying section amplifying only optical signals of the second wavelength band which have been demultiplexed by said demultiplexing unit, and

said optical amplifying unit supplying a part of said excitation light used in a part of said pre-stage optical amplifying section to said Raman amplification producing medium, wavelength division multiplexed signal light which contains optical signals of said second wavelength band which have been Raman amplified by said Raman amplification producing medium are input to said pre-stage optical amplifying section.

23. (AS UNAMENDED) An optical amplifier according to claim 22, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said pre-stage optical amplifying section contains a 1480nm band.

24. (AS UNAMENDED) An optical amplifier according to claim 23, wherein said pre-stage optical amplifying section comprises:

an erbium doped fiber;

at least one excitation light source generating excitation light of a 1480nm band; and

an optical coupler supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and supplied to said Raman amplification producing medium.

25. (AS UNAMENDED) An optical amplifier according to claim 18, wherein said Raman amplification producing medium is an optical fiber which is designed so that a non-linear effective cross section is small compared to a 1.3μm zero dispersion single mode fiber.

26. (AS UNAMENDED) An optical amplifier according to claim 18, wherein said external transmission path is of a hybrid transmission path formed by connecting a positive dispersion fiber having a positive wavelength dispersion value and a positive dispersion slope with respect to a signal light wavelength band, and a negative dispersion fiber having a negative wavelength dispersion value and a negative dispersion slope with respect to the signal light wavelength band, wherein one end on the side of said negative dispersion fiber is arranged at an input side of said optical amplifying unit and functions as said Raman amplification producing medium.

27. (AS UNAMENDED) An optical amplifier according to claim 18, wherein there is provided an optical power constant control unit monitoring an output power of said wavelength division multiplexed signal light, and controlling an excitation light driving condition of said optical amplifying unit so that said output power becomes constant.

28. (AS UNAMENDED) An optical amplifier according to claim 18, wherein there is provided a gain constant control unit monitoring a gain in said optical amplifying unit, and controlling an excitation light driving condition of said optical amplifying unit so that said gain becomes constant.

29. (AS UNAMENDED) An optical amplifier according to claim 18, wherein there is provided a supervisory control unit processing a supervisory control signal transmitted together with said wavelength division multiplexed signal light.

30. (AS UNAMENDED) An optical amplifier according to claim 22, further comprising:

a first power monitor unit monitoring the optical signal power of the first wavelength band which has been demultiplexed by said demultiplexing unit;

a second power monitor unit monitoring the optical signal power of the second wavelength band which has been amplified by said second optical amplifying section; and

an optical power deviation control unit controlling the operation of at least one of said pre-stage optical amplifying section and said second optical amplifying section in response to the respective monitor results of the first and second power monitor unit, so that the optical power deviation for the first and the second wavelength bands becomes constant.

31. (TWICE AMENDED) An optical amplifier for amplifying wavelength division multiplexed signal light which has respective optical signals of a first wavelength band <u>of a C band</u> containing a plurality of optical signals with several wavelengths different from each other and a second wavelength band <u>of a L band</u> containing a plurality of optical signals with several wavelengths different from the wavelengths of the optical signals contained in the first wavelength band, comprising:

an optical amplifying unit amplifying said wavelength division multiplexed signal light, and supplying an excitation light having a wavelength capable of producing a Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying unit, so that wavelength division multiplexed signal light which contains optical

signals of the second wavelength band which have been selectively Raman amplified by said Raman amplification producing medium, [are] is input to said optical amplifying unit.

32. (TWICE AMENDED) An optical amplifier for amplifying wavelength division multiplexed signal light which has respective optical signals of a first wavelength band of a C band containing a plurality of optical signals with several wavelengths different from each other and a second wavelength band of a L band containing a plurality of optical signals with several wavelengths different from the wavelengths of the optical signals contained in the first wavelength band, comprising:

optical amplifying means amplifying said wavelength division multiplexed signal light, and supplying an excitation light having a wavelength capable of producing a Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been selectively Raman amplified by said Raman amplification producing medium, [are] is input to said optical amplifying means.

33. (ONCE AMENDED) An optical amplifier, comprising:

an optical amplifying unit to amplify wavelength division multiplexed signal light which has respective optical signals of a first wavelength band of a C band containing a plurality of optical signals with several wavelengths different from each other and a second wavelength band of a L band containing a plurality of optical signals with several wavelengths different from the wavelengths of the optical signals contained in the first wavelength band, wherein,

said optical amplifying unit amplifies said wavelength division multiplexed signal light, and supplies an excitation light having a wavelength capable of producing a Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been selectively Raman amplified by said Raman amplification producing medium, [are] is input to said optical amplifying unit, and [.]

a C/L ratio control section, controlling a balance between a first wavelength band optical signal power and a second wavelength band optical signal power.

34. (ONCE AMENDED) An optical amplifier receiving optical signals of a first wavelength band of a C band and a second separate wavelength band of a L band, wherein each wavelength

band contains a plurality of optical signals of different wavelengths, said amplifier comprising:

a band demultiplexer providing a first band output and a second band output;

an amplifying unit amplifying the second band output; [and]

a band multiplexer combining the first band output and the amplified second band output; and [.]

a C/L ratio control section, controlling a balance between a first wavelength band optical signal power and a second wavelength band optical signal power.

35. (ONCE AMENDED) An optical amplifying system receiving optical signals of a first wavelength band of a C band and a second separate wavelength band of a L band, wherein each wavelength band contains a plurality of optical signals of different wavelengths, said system comprising:

an optical amplifier selectively amplifying the optical signals of the second wavelength band; and [.]

a C/L ratio control section, controlling a balance between a first wavelength band optical signal power and a second wavelength band optical signal power.